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THE EURO AND THE MEDITERRANEAN

THE EUROPEAN SINGLE CURRENCY AND MENA'S EXPORT TO EUROPE

Lahcen ACHY (1) & Khalid SEKKAT (2)
(1) Université Libre de Bruxelles & INSEA, Belgium & Morocco
(2) Université Libre de Bruxelles, Belgium

Institut de la Méditerranée
Palais du Pharo
58, Boulevard Charles Livon 13007 Marseille
Tel : 00 33 (0) 491 31 51 95 Fax : 00 33 (0) 491 31 50 38
ins.med@femise.org

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The European Single Currency and MENA's Export to Europe[1]

ACHY Lahcen[2] and SEKKAT Khalid[3]

Abstract

This paper investigates future exchange rate policy for MENA countries vis a vis the Euro aimed at fostering their manufactured exports towards Euroland. The exchange rate policy is captured through three different indicators: the real effective exchange rate changes, volatility and misalignment. The investigation is conducted for eleven sectors over the period 1970-1997. The sample includes the four North African countries (Algeria, Morocco, Tunisia, Egypt) and Turkey. The results show that exchange rate management plays a crucial role in providing incentives for manufactured exports toward Euroland. They also show that the food sector is weakly responsive to real exchange rate changes while the textile sector is highly responsive. Four growing sectors (Electronic, Electrical, Mechanical and Vehicles) were also found to be highly sensitive to exchange rate changes. Moreover the results suggest that policy makers should be more concerned with misalignment than with volatility.

Key words: Real Effective Exchange rate; Misalignment; Volatility; Manufactured exports; Panel data.

JEL Classification: C23; F14; F31.

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[2]Dulbea and Ecares ,Université Libre de Bruxelles and INSEA (Morocco).

[3]Corresponding author, Dulbea and Ecares, Univesite Libre de Bruxelles, CP 140, Avenue F.D. Roosevelt 50,Brussels 1050, Belgium. Tel: 00-32-2-6504139, Fax 00-32-2-6504123, Email ksekkat@ulb.ac.be

1 Introduction

Since January 1999 the Euro is the unique and official currency of the eleven European countries. The move through such a step of the process of economic integration in Europe has important implications both for member and non-member countries. While the impact on members has received large attention from the profession, the impact on non-members is still poorly explored. For the Middle Est and North African (MENA) countries the economic implications of the Euro are especially important. The MENA region is heavily dependent on the European Union (EU) as a market for its exports and a source for its imports. About 30% of total MENA exports are directed to the EU, and 44% of the total MENA imports originates from the EU. For some countries, such as North African countries, these ratios are generally above 60%.

The adoption of the Euro in 1999 and the dependency of MENA countries on trade with Europe pose the question of the choice of an optimal exchange rate management strategy for these countries. The Maasticht Treaty's Declaration on Monetary cooperation invites the EMU countries to cooperate with other non-European countries in order to create a monetary and financial environment favorable to trade and growth (Hadjimichael and Galy (1997)). To guide such a cooperation, an assessment of its economic consequences is necessary. The aim of this study is to conduct such an assessment for MENA countries. It focuses on the relationship between exchange rate management and trade.

There is a vast literature on the impact of exchange rate management on trade. A very large share of this literature focused on developed countries. It considers three variables : exchange rate changes, volatility and misalignment. Volatility is defined as frequent and non persistent fluctuations of exchange rate. Misalignment describes less frequent and more persistent swings of exchange rate. This literature reached no consensus about the impact of volatility on trade (See for instance Hooper and Kohlhagen (1978) and Cushman (1983)). In contrast an adverse impact of misalignment on trade was established (See De Grauwe (1987) and Froot and Klemperer (1989)).

In developing countries (LDCs) real exchange rate (RER) misalignment is generally associated with a substantially overvalued RER with respect to its market clearing. This is often an outcome mismanagement of economic policies. Moreover, inconsistent policies increase the volatility of RER. Recent analyses of the damaging influence of RER variability on trade in LDCs are Medhora (1990), Paredes (1989), Grobar (1993) and Sekkat and Varoudakis (2000).

Medhora (1990) and Paredes (1989) focused only on volatility. The evidence is mixed. Parades (1989) found a negative impact of volatility on the growth of manufactured export of Chile and Peru. Medhora (1990) examined the case of the West African Monetary Union (Benin, Burkina Faso, Côte d'Ivoire, Senegal and Togo) . The focus was on imports instead of exports. The empirical analysis failed to reveal any negative effect of exchange rate volatility on trade.

Grobar (1993) and Sekkat and Varoudakis (2000) examined the effect of both

exchange rate volatility and misalignment. Grobar (1993) focused on manufactured exports of ten middle-income countries (Argentina, Brazil, Colombia, Greece, Malaysia, Mexico, Philippines, South Africa, Thailand and Yugoslavia). She distinguished four categories of exports and used the black market premium as a proxy of misalignment. The results lent support to the hypothesis that exchange rate volatility negatively affects exports. Misalignment seemed, however, not to have played a central role in determining exports of the ten countries. Sekkat and Varoudakis (2000) focused on Sub-Saharan African countries over the period 1970-1992. They used a model based measure of misalignment and estimated export supply equations for three manufacturing sectors. Their results showed that exchange rate misalignment has an adverse effect on export performance while volatility does not.

This paper analyzes the impact of exchange rate policy in providing incentives for manufactured exports towards Europe. It considers the effect of real effective exchange rate (REER) changes vis a vis European currencies, the effect of its volatility and the effect of its misalignment. The investigation is conducted for eleven sectors of four North African countries (Algeria, Morocco, Tunisia, Egypt) and Turkey over the period 1970-1997. The empirical results provide support to the fact that exchange rate management plays a key role in providing incentives for manufactured exports from MENA to Europe. Exchange rate depreciations (vis a vis European currencies) increase manufactured exports while exchange rate misalignment or volatility decrease it. The results further showed that policy makers should be more concerned with misalignment than with volatility.

The rest of the paper is organized as follows. The second section presents a brief overview of trade and exchange rate policy in MENA countries. The third section is devoted to the Real Exchange Rate variability measurement. Section four presents the empirical results of sectors' sensitivity to exchange rate management. Section five provides an assessment of the potential impact of exchange rate management vis a vis the Euro on MENA trade. Finally, section six concludes.

2 Trade and exchange rate in MENA countries

2.1 Trade

For geographical as well as for historical reasons almost all MENA countries' major trading partners are from Euroland. Over the period 1990-97, 77% of Tunisia's exports have been oriented to Euroland market, 70% of Algeria's, 62% of Morocco's, 52% of Egypt's and 51% of Turkey's. These figures reflect the fact that these countries are heavily dependent on Euroland countries as a market for their exports. The same dependency exists for their imports since Euroland is also the main source of MENA imports. At the same time, the importance of

MENA countries in Euroland external trade is much smaller; it does not exceed 5%. Table (1) gives the relative importance of Euroland countries in MENA exports.

Table (10) reports the dynamic profile of exports oriented to Euro area over sub-periods from 1970 to 1997. One can observe the strong contribution of manufactured exports: Tunisia 89.5%, Turkey 88.6%; Egypt 76.2% and Morocco 64%. Algeria exhibits more dependence on exports of unfinished goods, the share of manufactured export does not exceed 19% and hydrocarbons continue to dominate its exports.

Textile exports remain the most dynamic element in most of the five countries, mainly because it does not require a high-skilled labor. This aspect can be considered as a major weakening of manufacturing sector in these countries. However, some more modern industrial sectors are emerging. For example, Electronic exports in Morocco represent 4% over the period 1990 to 1997, while it did not exceed 0.23% between 1970 and 1979. Electrical exports in Tunisia represent 6% over the period 1990-97 against only 0.45% during the period 1970-79.

2.2 Exchange rate

As a part of comprehensive economic reform programs, the five countries substantially reformed their foreign exchange systems in the late of 1980s and early 1990s by, gradually, unifying and liberalizing foreign exchange markets.

All countries have established current account convertibility. Egypt and Turkey have also achieved substantial capital account convertibility, while Algeria, Morocco, and Tunisia still have significant restrictions. Less restrictions are imposed, in general, on inflows than on outflows. All the countries permit non residents to hold accounts in foreign and domestic currencies, but residents' accounts are subject to more regulation than non residents' accounts and are fully convertible into foreign exchange only in Egypt.

To examine exchange rate evolution and assess the magnitude of its adjustment following the policy reforms we compute a series of real effective exchange rate (vis a vis European currencies). This is defined as the relative price of tradable to non-tradable goods. An increase in REER indicates a depreciation while a decrease reflects an appreciation. For a given country, REER is computed as:

$$\log REER = \sum_{j=1}^{N} w_j \log \frac{e_j WPI_j}{CPI} \qquad (1)$$

where e_j is the bilateral nominal exchange rate vis-à-vis country j, WPI_j is the wholesale price index of country j and proxies for the foreign price of tradable goods, CPI is the consumer price index of the home country and

proxies for the domestic price of non-tradable goods, w_j is the share of partner j in home country's exports[4]. Trade shares are the averages over the whole period.

Bilateral exchange rate data, wholesale price and consumer price indexes are drawn from IMF's International Financial Statistics. The weights are computed from CHELEM database (Harmonized Accounts on Trade and the World Economy database)[5].

Figure (1) presents the behavior of the real effective exchange rate on a monthly basis for the five countries in the sample.

In every country the REER has experienced significant movements during the past 26 years. However, the extent of variations is different across countries. The real effective exchange rate indexes have fluctuated more in Algeria and Egypt than in the remaining countries. In Tunisia and Morocco, there is a slight but steady trend of real effective exchange rate depreciation initiated in the middle of eighties. This tendency can be explained as the outcome of exchange rate reforms undertaken in these countries.

3 Exchange rate variability

3.1 Real exchange rate volatility

Following Kenen and Rodrik (1986) and Grobar (1993) we use two measures of REER volatility. A first one is the standard deviation of 12 month to month changes in REER:

$$V_1 = [(\frac{1}{12}) \sum_{i=1}^{*} (\Delta REER_{t\,i\,i})^2]^{\frac{1}{2}} \qquad (2)$$

Figure (2), presents the behavior of volatility according to this measure. During the period 1970-1988, the extent of volatility was relatively limited in the five countries. Since 1988 there has been more volatility in Egypt specifically from 1989 to 1992 due to multiple nominal exchange rate devaluations that have taken place. Algeria has experienced large swings in real exchange rate volatility since the beginning of the 1990s as a consequence of economic austerity and political instability. In Turkey, we observe an increase in real exchange rate volatility in 1993. This volatility is still limited when compared to nominal volatility of the Turkish Lira. Finally, in Morocco and Tunisia the size of real exchange rate volatility has been overall relatively small over the whole period. This is mainly due to the exchange rate regime adopted in both countries in

[4]Here we consider the eleven countries of Euroland. As Belgium and Luxembourg have a monetary union we end up with ten partners.

[5]CHELEM database, CEPII, Paris.

which the external value of their currencies is determined on the basis of a basket of their partners' currencies.

The second measure of volatility uses an ARCH model. This specification implies that information about volatility observed in the previous period is used to forecast the volatility of the current period. The ARCH model is defined as follows:

$$\log REER_t = Á_0 + Á_1 \log REER_{t\,i\,1} + ²_t \qquad (3)$$

where $¾^2_t = ! + ®"^2_{t\,i\,1}$

The measure of volatility derived from this model attempts to capture "volatility clustering", very often, observed in real exchange rate behavior. The idea is that large swings in the past tend to generate higher expected volatility in the following periods.

The conditional variance $¾^2_t$ (based on past information) is a function of the mean ! and news about volatility from the previous period $"^2_{t\,i\,1}$. Table (2) reports the estimation results for the five countries and figure (3) depicts the behavior of REER volatility from the ARCH model.

The estimation results show that, overall, the ARCH model represents a good fit for real exchange rate volatility. The autoregressive coefficient is highly significant in all cases and very close to one. The ARCH parameter, which gives an idea about volatility clustering in the behavior of real exchange rate, is also statistically significant in all countries except in Egypt and Algeria.

Figure (3) displays the ARCH measure of volatility. As noticed before, the extent of real exchange rate volatility is higher in Egypt and Algeria. According to the ARCH model, real exchange rate volatility is steadily decreasing in Turkey over the period. One explanation of this tendency is the adoption of real exchange rate rule, where domestic consumer price index is adjusted to maintain roughly the purchasing power of the domestic currency. Finally real exchange rate volatility in Morocco and Tunisia is of a small magnitude over the whole period.

3.2 Real exchange rate misalignment

Real exchange rate misalignment is a sustained departure of actual real exchange rate from its equilibrium value. Therefore the information about the extent of misalignment requires knowledge of the level of the equilibrium real exchange rate, which is unobservable and depends on both structural and macroeconomic factors.

In LDCs misalignment takes, in general, the form of domestic currency overvaluation, which hurts tradable activities and affects economic growth. In many LDCs official exchange rates were maintained artificially at overvalued levels

with regard to their equilibrium by imposing strict exchange controls (Edwards 1989).

One simple and direct approach to estimating misalignment is the premium on parallel market (PMP) of exchange rate. The intuition behind is that the more overvalued the REER is, the tighter will be the control on foreign exchange and, as an outcome, the higher will be the PMP. Table (3) reports the (PMP) extent of parallel market premium expressed as a percentage of nominal official exchange rate against the US dollar. Except for Morocco and Tunisia where over the whole period the size of PMP was low, the three other countries experienced very high levels of PMP. This is specifically the case of Turkey where parallel market rate of Turkish Lira was more than seven times lower than its official rate during the period 1974-1979. This is also the case of Algeria where the black market of the Dinar was almost four times lower than its official rate during the period 1985-89 and two times lower during the period 1990-97. Thanks to exchange rate reforms undertaken in Turkey and Egypt, aiming at easing restrictions on foreign exchange holding by residents, the level of PMP in both countries has significantly decreased during the last period.

Another measure of misalignment was suggested by Edwards (1988). This is a model-based approach which distinguishes among two main sources of RER variations: First, changes in external or domestic "fundamentals" which bring about changes in the equilibrium RER (international terms of trade, international transfers, technological progress). Second, misconceived domestic policies which may create "policy-induced misalignment" (excess domestic credit creation, excessive foreign borrowing, excessively inward-oriented trade policies). In estimating the impact of these factors the following empirical model ,suggested by Cottani et all (1990) and Ghura and Grennes (1993), is used:

$$\log REER_{it} = fi_i + \acute{}_1 \log(\frac{P_x}{P_m})_{it} +$$

$$\acute{}_2 \log(\frac{Y}{X+M})_{it} + \acute{}_3(\frac{C}{Y})_{it} + \acute{}_4 EXC_{it} + \acute{}_5 EXDEV_{it} + \grave{A}_{it} \qquad (4)$$

where REER is the real effective exchange rate as measured by equation (1); $(\frac{P_x}{P_m})$ is the external terms of trade with respect Euroland; $\frac{Y}{X+M}$ is an inward orientation indicator computed as the ratio of GDP to the sum of exports (X) and imports (M); $\frac{C}{Y}$ is the net capital inflow (computed as the difference between net change in reserves and trade balance) scaled by GDP; EXC represents the excess domestic credit expansion measured as the difference between growth in domestic credit and real GDP growth; EXDEV is the changes in the official exchange rate in %, t is the time index and finally $\grave{A}_{it}$ is a random term.

Equation (4) was estimated using panel data methods. The estimation took account of both heteroskedasticity and autocorrelation in the random component of the model (Feasible Generalized Least Squares; FGLS). The sample consists of a balanced panel over the period 1970-97. The Hausman and the F tests suggest that the fixed effects specification fits better the data.

The estimation results are:

$$\log REER_{it} = \underset{(-10.14)}{-0.52} \log\left(\frac{P_x}{P_m}\right)_{it} \underset{(-15.42)}{-0.77} \log\left(\frac{Y}{X+M}\right)_{it} \quad (5)$$

$$\underset{(-7.29)}{-2.06} \left(\frac{C}{Y}\right)_{it} + \underset{(0.90)}{0.10} EXC_{it} + \underset{(2.31)}{0.17} EXDEV_{it}$$

$$\bar{R}^2 = 0.80 \quad F-Test = 125.9 \quad Hausman-Test = 21.67 \quad N=Obs = 125$$

According to the estimation, the empirical model accounts for a large proportion of the observed variation in real exchange rate. As expected, term of trade improvements, restrictive trade policies as reflected by the inward-orientation ratio and higher capital inflows lead to an appreciation of real exchange rate. Moreover, they are statistically significant. The excess domestic credit, although with the expected sign, fails to be significant. Nominal devaluations influence real exchange rate significantly and in the expected direction.

Real effective exchange rate can depart from its equilibrium value as a result of excess domestic credit creation, excessive foreign borrowing or excessive trade protection. Therefore, the equilibrium real exchange rate (ERER) can be obtained as follows:

$$\log ERER_{it} = \beta_i + \beta_1 \log\left(\frac{P_x}{P_m}\right)_{it} + \beta_2 \log\left(\frac{\overline{Y}}{X+M}\right)_{it} + \beta_3 \left(\frac{\overline{C}}{Y}\right)_{it} + \beta_4 \overline{EXC}_{it} + \beta_5 EXDEV_{it} \quad (6)$$

Where the upper bar indicates the sustainable value of the underlying variable[6]. The regression-based index of misalignment account for the difference between sustainable and actual values of the policy variables used as regressors. This index is then computed as follows:

$$RERMIS_{it} = \exp(Mis_{it}) - 1 \quad (7)$$

where:

$$Mis_{it} = \log ERER_{it} - \log REER_{it}$$

[6] The sustainable values of $\frac{Y}{(X+M)}$; $\frac{C}{Y}$ and EXC are computed in the same way as in Cottani et al. (1990) and Sekkat & Varoudakis (2000). Terms of trade is an exogenous non-policy variable. Nominal devaluation is used to eliminate induced misalignment.

Table (4), reports the implied rate of misalignment of MENA currencies with respect to European currencies. Real exchange rate is overvalued (Mis>0) whenever it is below its "equilibrium value" and vice versa. According to our calculations, during the period 1990-1997, all currencies were overvalued except the Moroccan dirham. The overvaluation is more pronounced for the Algerian Dinar, which experienced an overvaluation of 6.77%, The Tunisian Dinar and the Egyptian Pound have experienced, roughly, 3% overvaluation. The Turkish Lira is closer to its equilibrium value.

4 Export performance and exchange rate policy

This section investigates the impact of exchange rate policy on exports of the five MENA countries. The econometric methodology is similar to Grobar (1993) and Sekkat and Varoudakis (2000). The following export supply equations are estimated using panel data approach over the period 1970-1997:

$$\log(X_{it}^{j}) = \alpha_j + \beta_1 \log(VA_{m_t}^{j}) + \beta_2 \log REER_t^j + \beta_3 \log V_t^j + \beta_4 Mis_t^j + \varepsilon_{it}^j \quad (8)$$

where X_i is the ratio of export of sector i over GDP, REER is the real effective exchange rate, V is the measure of volatility, Mis is the measure of misalignment, VA_m is the ratio of manufactured value added over GDP, t is the time index, j refers to the countries and i refers to the sectors.

In equation (8), exports are set as a ratio to GDP to allow for differences in country size. The VA_m is intended to control for non-exchange rate determinants of export.

The coefficient β_1 may be positive or negative depending on the nature and export-orientation of different sectors. The expected sign of β_2 is positive which implies that a depreciation of the real exchange rate should boost exports. Given that volatility and misalignment of currencies are harmful to export β_3 and β_4 are expected to be negative.

The series of GDP, total exports and manufactured value added are drawn from IMF database and UNIDO Country Industrial Statistics database. Data on sectorial exports oriented to Euroland are drawn from CHELEM database[7]. The parallel market premium data is drawn from the World Currency Yearbook.

The estimation results are presented in Tables (5) to (8). A separate equation is estimated for each sector. On the basis of Hausman and F tests, fixed effects terms are included to capture country specific effects. The Feasible Generalized Least Squares (FGLS) estimation is used to correct for both heteroskedasticity and autocorrelation of the random component of the model.

Table (5) presents estimation results when volatility is measured by standard deviation of monthly changes of real exchange rate and misalignment is based

[7] CHELEM database (July 1997), CEPII, Paris.

on the black market premium. In all sectors, estimates of the coefficients of REER have the expected positive sign, moreover the estimated coefficients are significant at 95 percent level of confidence in 8 sectors out of 11. The estimated coefficients of volatility are negative as expected in 7 sectors, among which only 2 are significant at 95 percent level of confidence. Whenever those coefficients have positive sign they are not statistically significant except for electronic. The estimated coefficients of PMP have the expected negative sign in 8 sectors out of 11, among which 6 are significant. The positive coefficients are not significant.

Table (6) reports estimation results when volatility of real exchange rate is based on an ARCH model of REER and misalignment is based on black market premium as in table (5). The results are qualitatively comparable when observing the estimated coefficients of REER. However, volatility seems to have a more explanatory power than in table (5). The expected negative sign is reported in 9 sectors out of 11 (among of 7 are significant). The other explanatory variables (misalignment and manufactured value added) react qualitatively in a similar way as in table (5).

Table (7) shows estimation results when volatility is measured by standard deviation of monthly changes of real exchange rate and misalignment is based on the equilibrium exchange rate model. The estimates presented in this table provide strong support for the stimulating effects of exchange rate policy on exports. The estimates of the coefficients on misalignment exhibit the expected negative sign in all sectors, among of 8 are statistically significant.

Finally, table (8) reports estimation results when volatility is based on an ARCH model and misalignment on the equilibrium exchange rate model. This last specification seems to perform better in capturing the expected effects for the three exchange rate indicators. Whatever the sector, the significant exchange rate variables (REER, volatility and misalignment) have the expected sign. The real exchange rate is statistically significant in all sectors but food and agriculture. Volatility has the negative expected effect, significant in all sectors except for food and agriculture, chemicals, and non ferrous. Finally, except for wood and paper, and electrical exports, misalignment of REER exerts a significant negative impact on export performance.

These findings suggest that exchange rate management plays a crucial role in providing incentives for exports from MENA to Europe. These effects are better captured through the last specification, where volatility is measured by an ARCH model and misalignment by the difference between equilibrium Real exchange rate based on fundamentals and observed REER. Another important finding that emerges from these results is that the degree of responsiveness is different across sectors. Textiles is one of most sensitive sectors to exchange rate changes and meanwhile one of the important export sectors in MENA region.

5 Impact of exchange rate changes against the Euro on MENA trade

One goal of this paper is to shed light on the potential impact of MENA countries' exchange rate management vis a vis the Euro on trade flows from these countries to Europe. This should lead to recommendations concerning the exchange rate policy of MENA countries with respect to the Euro. To this end we combine the estimation results in table (8) with data on sectorial exports to identify the key sectors for MENA economies and the extent of their sensitivity to the Euro fluctuations. We then address the costs of volatility and misalignment for these key sectors.

Table (9) presents the share of each sector in exports to Europe in 1997 and estimation results using the ARCH volatility and the model-based misalignment measures. Unsurprisingly, the Energy sector accounts for almost all Algerian exports toward Europe. It also represents a large share of the Egyptian exports. Given its specificity we shall abstract from this sector, and hence from Algeria, in the subsequent analysis. Looking at the remaining sectors, some similarities emerge across the four countries. The textile sector is the most important in terms of exports to Europe in each country. The food sector emerges as the second most important sector. The chemical sector also represents an important share of exports to Europe in each country. Depending on the country, it stands as the third or the fourth most important sector. The remaining sectors are of different importance depending on the country. Note however, that Turkey's sectorial exports appear to be more diversified than other countries' exports.

The figures in table (9) give the picture for 1997 only. Relying on these figures does not permit to capture the dynamics of specialization of each country. Table (10) presents the dynamic profile of exports to Europe over the period 1970-1997. The textile sector is not only the most important in each country (abstracting from energy) but, in addition, its share in total exports to Europe is steadily increasing. The importance of food is, in contrast, steadily decreasing in each country. The importance of chemicals decreased in Morocco and Tunisia while it slightly increased in Egypt and Turkey. Finally in the four countries the importance of four sectors (Electronic, Electrical, Mechanical and Vehicles) is steadily increasing although their shares are sometimes still low. The shares are especially low for Electrical and Electronic products in Egypt and for Vehicles in the three North African countries. The results clearly suggest a changing pattern of specialization of the four countries. This was also shown by Fontagné and Pérridy (1996) who found an increasing specialization of Morocco and Tunisia in Electrical goods. Hence the analysis of the impact of exchange rate management should also consider those sectors that, although of moderate importance, may become important in the future.

The sensitivity to exchange rate changes and hence the responsiveness of supply to incentives is reflected by the coefficients of REER. The results in ta-

ble (9) show that the food sector is weakly responsive. The elasticity is by far lower than those of other sectors. This result is not surprising since exports of food and agricultural products to Europe are highly influenced by the restrictions of the European Common Agricultural Policy. Market mechanisms are not allowed to operate freely in this case. The textile sector is highly responsive to market incentives with an elasticity of 2.32. This sector is very important in the four countries who are highly competing with South-European countries in this market. Hence exchange rate management vis-à-vis the Euro may be an important determinant for MENA countries' competitiveness in this sector. Finally, the four growing sectors (Electronic, Electrical, Mechanical and Vehicles) are highly sensitive to exchange rate changes. The elasticities range from 1.77 to 3.66. Exports supply in these sectors can increase highly following an exchange rate depreciation. This suggests the possibility of further growth of these sectors and that exchange rate management may play an important role in this respect.

To draw further recommendations about exchange rate management vis-à-vis the Euro one should also consider the impacts of volatility and misalignment. It can be expected that countries experiencing substantial real exchange rate misalignment will also exhibit higher degree of measured volatility- as periods of increasingly overvalued real exchange rate would be followed by large devaluations, increasing REER volatility. However, it is also possible that big swings in fundamentals cause high REER volatility without necessarily resulting in REER misalignment. This could especially be the case for countries where REER volatility primarily reflects big swings in the terms of trade. In that case, in order to reduce REER volatility, it might be necessary to increase the REER misalignment.

The estimated elasticities of REER misalignment and volatility on manufactured exports suggest that REER misalignment is probably more harmful that REER volatility. Managing exchange rate policy with a view of avoiding REER misalignment rather than volatility should therefore be of more concern to policy-makers aiming at promoting manufactured export performance. Relying on the estimated elasticities is not sufficient, however. The impact on export depends also on the extent of volatility and of misalignment. Table (11) presents an assessment of the impact of volatility and misalignment combining the elasticities and the level of these variables. Instead of assuming a given level of these variables which will be necessarily arbitrary, we use the observed levels during the period 1990-1997. This is the most recent period and a period in which the countries have already engaged in a process of policy reforms (including exchange market). Hence the levels of volatility and misalignment may be considered as a reasonable scenario for the future. During the period 1990-1997, the Moroccan dirham experienced very low levels of volatility and misalignment. Hence no additional insight may be drawn from table (11). For the other countries, the figures clearly show that misalignment is much more harmful than volatility. For textiles, the losses in the share to GDP of its ex-

ports to Europe are respectively 15.57%, 17.28% and 8.72% for Egypt, Tunisia and Turkey due to misalignment and 1.15%, 0.18% and 1.15% due to volatility. Similarly, the losses for the electrical sector are 11.88%, 13.19% and 6.65% due to misalignment and 2.92%, 0.47% and 2.92% due to volatility. These figures confirm the recommendation based on elasticities that policy maker should be more concerned with misalignment than with volatility.

6 Conclusions

In this paper, the effects of exchange rate management (vias vis European currencies) on manufactured exports from North African countries and Turkey to Europe has been analyzed. We constructed an appropriate measure of real effective exchange rate and used different measures of volatility and misalignment to assess the robustness of our econometric results. The study is conducted for eleven sectors and covers the period 1970-1997. The results allow us to identify a strong negative effect of real effective exchange rate variability on manufactured exports.

The findings suggest that exchange rate management plays a crucial role in providing incentives for exports. These effects are better captured through a specification, where volatility is measured by an ARCH model and misalignment by the difference between "equilibrium REER" and observed REER. All sectors are responsive to exchange rate changes but the degree of responsiveness is different across sectors. Volatility has the negative expected effect, significant in all sectors except for food and agriculture, chemicals, and non ferrous. Finally, except for wood and paper, and electrical exports, misalignment of REER exerts a significant negative impact on export performance.

The assessment of the sectorial sensitivity to exchange rate shows that the food sector is weakly responsive to real exchange rate changes. This result is not surprising due to the restrictions of the European Common Agricultural Policy. The textile sector is, in contrast, highly responsive to market incentives, which means that exchange rate management vis-à-vis the Euro may be an important determinant for MENA countries' competitiveness in this sector. Four growing sectors (Electronic, Electrical, Mechanical and Vehicles) are also highly sensitive to exchange rate changes. Exports supply in these sectors can increase highly following an exchange rate depreciation. This suggests the possibility of further growth of these sectors and that exchange rate management may play an important role in this respect.

To draw further recommendations about exchange rate management vis-à-vis the Euro we consider also the impacts of volatility and misalignment. The estimated elasticities of REER misalignment and volatility suggest that REER misalignment is more harmful than REER volatility. Further Calculations confirm the recommendation based on elasticities that policy makers should be more concerned with misalignment than with volatility.

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Table 1. Major Euroland Trading partners (1990-97)[8]

	Algeria	Morocco	Tunisia	Egypt	Turkey
Euroland	70	62	77	52	51
Non Euroland	30	38	23	48	49
France	28	49	31	13	16
Germany	19	15	17	10	55
Italy	25	10	34	57	12
Spain	10	12	6	8	01
Others	18	14	12	12	16
Total	100	100	100	100	100

Table 2. Estimation results of ARCH model[9]

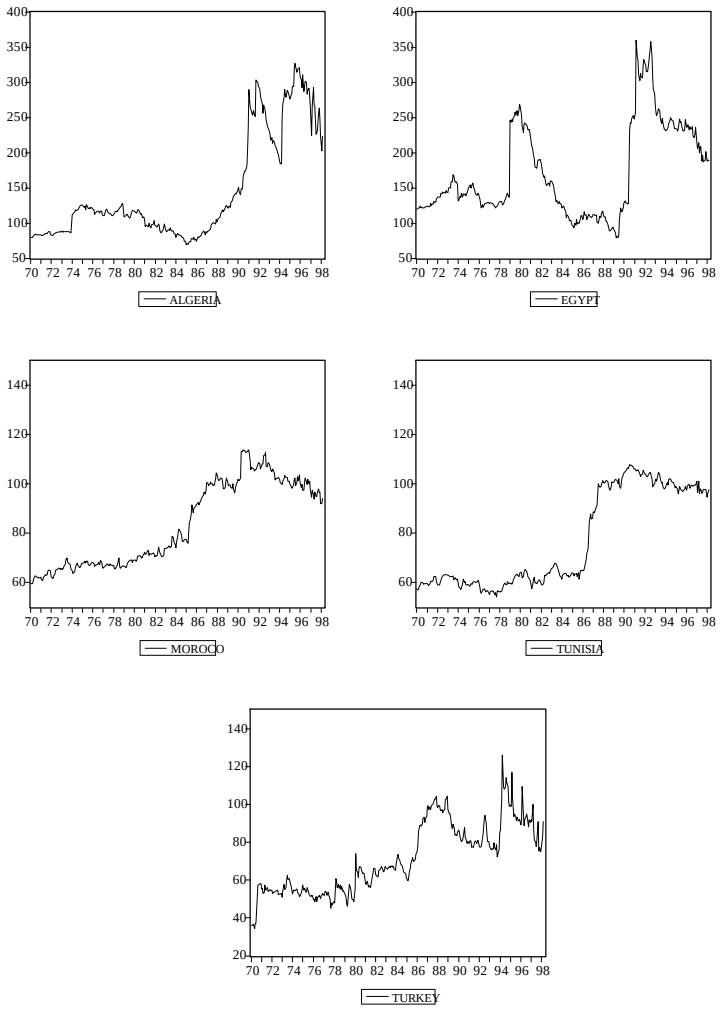
Parameters	Algeria	Morocco	Tunisia	Egypt	Turkey
$Á_0$	0.04*	0.03**	0.01	0.08*	0.12
	(1.6)	(1.9)	(0.1)	(1.7)	(1.5)
$Á_1$	0.99**	0.99**	0.99**	0.98**	0.97**
	(178)	(266)	(361)	(116)	(52)
!	0.001**	0.002**	0.0002**	0.03**	0.002**
	(3.3)	(4.9)	(3.8)	(2.4)	(4.3)
f	0.18	0.21**	0.38*	-0.01	0.31*
	(1.2)	(3.0)	(2.4)	(-1.2)	(1.9)
$\overline{R}^2$	0.98	0.99	0.99	0.97	0.95
N± obs	335	335	335	335	335

{ Note: the estimated equation is: $\log RER_t = Á_0 + Á_1 \log RER_{t\,i\,1} + {}^2_t$, for each country where ^2_t is assumed to have an ARCH structure defined by the equation $¾^2_t = ! + ff"^2_{t\,i\,1}$. The estimated coefficients are presented in the table. (*), (**) mean that the corresponding coefficient is significant, respectively, at 10% and 5%. The figures within brackets refer to z-statistic.

[8] This table reports the average exports (over the period 1990-1997) oriented to Euroland and non-Euroland partners. It also gives the relative weight of the main Euroland partners.

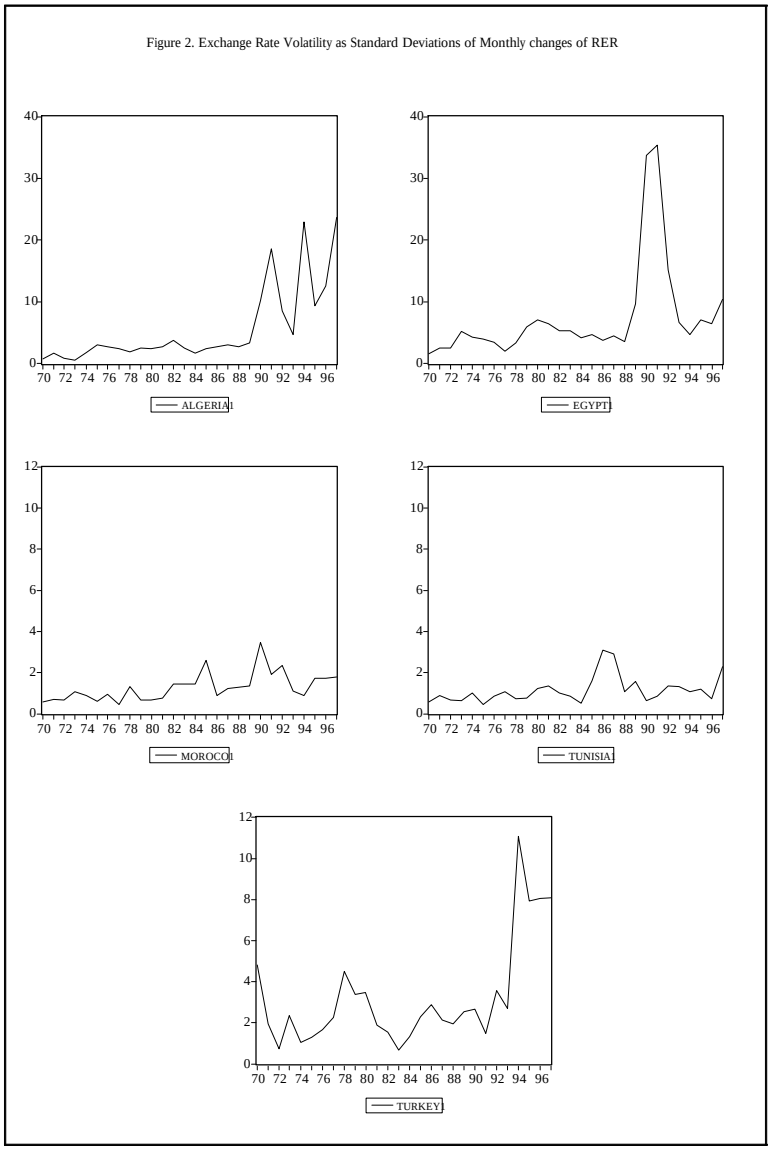
[9] It is assumed that residuals from AR(1) specification of RER follow an ARCH(1). The ARCH model is appropriate when there is a tendency for large residuals to cluster together.

Figure 1. Real Effective Exchange Rate in MENA countries
(1970-1997)



{ Note that for Algeria and Egypt the scale of real effective exchange rate ranges between 50 and 400, while for Morocco, Tunisia and Turkey the scale varies between 50 and 150.

Figure 2. Exchange Rate Volatility as Standard Deviations of Monthly changes of RER



{ Note that for Algeria and Egypt the scale of real effective exchange volatility ranges between 0 and 40, while for Morocco, Tunisia and Turkey the scale varies between 0 and 12.

Figure 3. Exchange Rate Volatility Based on an ARCH Model of RER

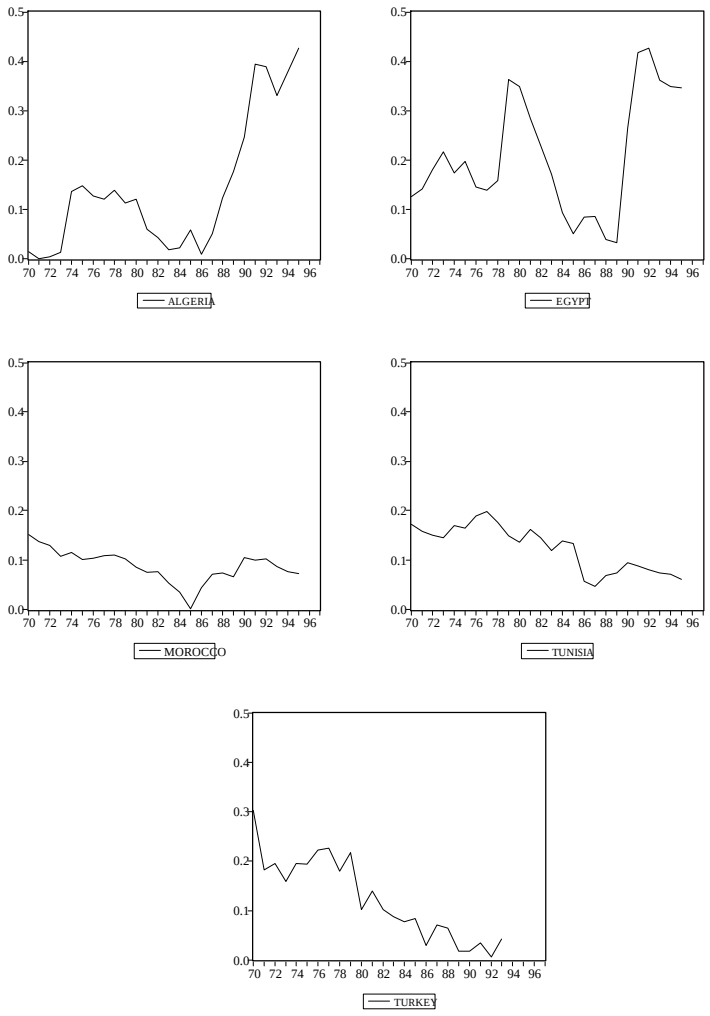


Table 3. Parallel Market Premium in % of Official Exchange Rate

	Algeria	Morocco	Tunisia	Egypt	Turkey
1970-74	51	5	15	83	120
1974-79	96	7	5	61	732
1980-84	242	5	8	39	477
1985-89	379	3	4	160	44
1990-97	194	4	4	9	6

Table 4. Misalignment rate with respect Euro currencies

	Algeria	Morocco	Tunisia	Egypt	Turkey
1970-74	-9.14	2.54	-5.40	0.12	2.57
1974-79	-1.10	0.73	0.56	-2.98	-0.40
1980-84	-3.76	0.29	-2.47	-2.71	-5.60
1985-89	2.12	-3.47	1.66	1.36	1.64
1990-97	6.77	-0.16	3.33	3.00	1.68

Table 5. Estimation results with a measure of Misalignment based on black market premium and Volatility based on standard deviation of monthly REER changes*

	log REER	log v	Mis	log VA	$\overline{R}^2$	F-test
Energy	0.40#	0.00	-0.61**	-0.48**	0.79	29.74
	(1.97)	(-0.01)	(-4.42)	(-2.70)		
Food and Agriculture	0.08	-0.18*	-0.84**	-0.08	0.85	32.11
	(0.39)	(-2.63)	(-5.11)	(-0.45)		
Textiles	1.41**	-0.02	-0.47**	0.71*	0.86	64.81
	(6.03)	(-0.18)	(-2.98)	(2.53)		
Wood and paper	0.49**	-0.17**	-0.34**	0.20	0.93	132.7
	(3.75)	(-3.10)	(-3.08)	(1.32)		
Chemicals	0.43**	0.01	-0.08	0.48**	0.96	224
	(3.88)	(0.30)	(-1.18)	(4.84)		
Iron and Steel	0.18	-0.14	-0.44**	0.09	0.32	7.5
	(0.67)	(-1.21)	(-3.10)	(0.28)		
Non ferrous	0.11	-0.04	-0.25*	-0.32	0.70	30.75
	(0.53)	(-0.65)	(-2.31)	(-1.46)		
Mechanical	0.98**	-0.01	0.17	1.87**	0.72	19.8
	(4.59)	(-0.09)	(1.16)	(7.99)		
Vehicles	1.70**	0.19	0.52	1.30**	0.61	24.2
	(4.17)	(0.94)	(1.58)	(3.30)		
Electrical	1.01**	0.10	-0.19	1.23**	0.67	30.39
	(3.13)	(0.83)	(-0.95)	(3.70)		
Electronic	0.61*	0.28*	0.29	0.74*	0.75	49.8
	(2.01)	(2.14)	(1.43)	(2.65)		

*All estimates are obtained on the basis of the fixed effect method pooling over countries and using FGLS to account for both cross-section heteroskedasticity and contemporaneous correlation. The figures within the brackets refer to t-statistics. The critical value of F-test for common intercept for all countries is (4.8014). (#), (*) and (**) indicate that the corresponding coefficient is significant, respectively, at 10% and 5% and 1%. Number of observations is 125.

Table 6. Estimation results with a measure of Misalignment based on black market premium and Volatility based on an ARCH model of REER *

	log REER	log v	Mis	log VA	$\overline{R}^2$	F-test
Energy	0.63**	-0.12#	-0.68**	-0.77**	0.79	27.41
	(2.73)	(-1.83)	(-4.28)	(-3.63)		
Food -Agriculture	-0.01	-0.03	-0.80**	-0.02	0.83	22.62
	(-0.06)	(-1.18)	(-5.16)	(-0.15)		
Textiles	1.63**	-0.21**	-0.37*	0.62*	0.87	63.85
	(6.61)	(-3.16)	(-2.33)	(2.08)		
Wood and paper	0.19	-0.02	-0.38**	0.21	0.92	147
	(1.59)	(-0.72)	(-3.38)	(1.25)		
Chemicals	0.24*	0.08*	-0.07	0.61**	0.96	266
	(2.26)	(2.49)	(-1.10)	(5.49)		
Iron and Steel	-0.26	0.10#	-0.52**	0.43	0.32	8.75
	(-1.18)	(1.86)	(-3.67)	(1.31)		
Non ferrous	0.17	-0.07*	-0.26*	-0.42#	0.70	30.56
	(0.94)	(-2.06)	(-2.45)	(-1.90)		
Mechanical	1.16**	-0.10*	0.19	1.70**	0.73	20.49
	(5.78)	(-2.02)	(1.32)	(7.07)		
Vehicles	3.37**	-0.56**	0.78*	0.40	0.66	33.21
	(10.7)	(-5.95)	(2.54)	(0.94)		
Electrical	1.72**	-0.32**	-0.26	0.90*	0.71	38.68
	(4.91)	(-3.76)	(-1.36)	(2.43)		
Electronic	1.61**	-0.33**	0.30	0.22	0.77	59.28
	(4.93)	(-3.87)	(1.42)	(0.76)		

{ *All estimates are obtained on the basis of the fixed effect method pooling over countries and using FGLS to account for both cross-section heteroskedasticity and contemporaneous correlation. The figures within the brackets refer to t-statistics. The critical value of F-test for common intercept for all countries is (4.8014). (#), (*) and (**) indicate that the corresponding coefficient is significant, respectively, at 10% and 5% and 1%. Number of observations is 125.

Table 7. Estimation results with a measure of Misalignment based on the equilibrium exchange rate model and Volatility based on standard deviation of monthly REER changes*

	log REER	log v	Mis	log VA	$\overline{R}^2$	F-test
Energy	1.69**	-0.21*	-5.77**	-0.46*	0.75	23.62
	(6.98)	(-2.48)	(-4.05)	(-2.38)		
Food and Agriculture	0.93**	-0.23**	-3.40**	-0.29	0.83	55.92
	(4.26)	(-3.38)	(-3.27)	(-1.45)		
Textiles	2.16**	-0.15#	-6.00**	0.66*	0.89	110.25
	(7.84)	(-1.86)	(-4.46)	(2.32)		
Wood and paper	1.09**	-0.20**	-1.70#	0.38*	0.85	191.6
	(5.96)	(-3.22)	(-1.75)	(2.23)		
Chemicals	0.91**	0.02	-3.51**	0.48**	0.94	230
	(7.70)	(0.35)	(-4.87)	(4.40)		
Iron and Steel	1.03**	-0.23#	-1.40	0.77*	0.25	6.63
	(3.09)	(-1.75)	(-0.72)	(2.16)		
Non ferrous	1.03**	-0.11#	-4.39**	-0.40#	0.73	58.37
	(5.59)	(-1.86)	(-5.01)	(-1.86)		
Mechanical	1.38**	-0.02	-2.67#	1.76**	0.63	16.62
	(5.05)	(-0.17)	(-1.74)	(7.51)		
Vehicles	2.06**	0.12	-0.26	1.48**	0.52	17.95
	(4.13)	(0.68)	(-0.11)	(3.59)		
Electrical	2.06**	-0.02	-5.58*	1.25**	0.65	31.43
	(4.74)	(-0.19)	(-2.86)	(3.60)		
Electronic	1.48**	0.18	-5.37**	0.99**	0.59	28.12
	(3.53)	(1.53)	(-2.79)	(3.33)		

*All estimates are obtained on the basis of the fixed effect method pooling over countries and using FGLS to account for both cross-section heteroskedasticity and contemporaneous correlation. The figures within the brackets refer to t-statistics. The critical value of F-test for common intercept for all countries is (4.7067). (#), (*) and (**) indicate that the corresponding coefficient is significant, respectively, at 10% and 5% and 1%. Number of observations is 120.

Table 8. Estimation results with a measure of Misalignment based on the equilibrium exchange rate model and Volatility based on an ARCH model of REER*

	log REER	log v	Mis	log VA	$\overline{R}^2$	F-test
Energy	1.60**	-0.19**	-5.13**	-0.79**	0.76	25.78
	(6.90)	(-3.19)	(-3.13)	(-3.27)		
Food and Agriculture	0.58**	0.01	-2.36**	-0.02	0.79	54.97
	(3.61)	(0.54)	(-3.06)	(-0.14)		
Textiles	2.32**	-0.22**	-5.19**	0.29	0.90	123.82
	(9.14)	(-4.48)	(-3.80)	(1.02)		
Wood and paper	1.38**	-0.22**	-2.46*	-0.14	0.86	270
	(9.04)	(-6.96)	(-2.60)	(-0.73)		
Chemicals	0.93**	-0.02	-3.37**	0.45**	0.94	332.15
	(8.85)	(-0.73)	(-4.56)	(4.01)		
Iron and Steel	1.16**	-0.16*	-1.53	0.44	0.25	6.88
	(4.72)	(-2.74)	(-0.77)	(1.07)		
Non ferrous	0.99**	-0.10**	-3.57**	-0.53*	0.73	70.26
	(5.61)	(-3.13)	(-3.67)	(-2.45)		
Mechanical	1.77**	-0.21**	-2.73#	1.37**	0.67	24.58
	(7.62)	(-4.42)	(-1.91)	(5.73)		
Vehicles	3.66**	-0.71**	0.84	-0.05	0.64	36.23
	(8.27)	(-7.85)	(0.33)	(-0.12)		
Electrical	3.05**	-0.56**	-3.96	0.36	0.72	56.18
	(8.04)	(-6.52)	(-1.63)	(0.91)		
Electronic	2.29**	-0.51**	-3.12	0.09	0.69	55.44
	(5.95)	(-5.68)	(-1.29)	(0.28)		

*All estimates are obtained on the basis of the fixed effect method pooling over countries and using FGLS to account for both cross-section heteroskedasticity and contemporaneous correlation. The figures within the brackets refer to t-statistics. The critical value of F-test for common intercept for all countries is (4.7067). (#), (*) and (**) indicate that the corresponding coefficient is significant, respectively, at 10% and 5% and 1%. Number of observations is 120.

Table 9. Sectoral Sensitivity to Exchange Rate Management and Sectorial Contribution to Total Exports to Europe

	Estimated coefficients				Contribution in exports to Europe				
	logREER	logV	Mis	logVA	Algeria	Morocco	Egypt	Tunisia	Turkey
Energy	1.60**	-0.19*	-5.13*	-0.79*	96.81	0.33	55.15	8.04	0.93
Food & Agric.	0.58*	0.01*	-2.36*	-0.02	0.40	21.61	8.59	8.80	17.09
Textiles	2.32**	-0.22*	-5.19*	0.29	0.10	48.68	21.26	62.31	51.30
Wood & paper	1.38**	-0.22*	-2.46*	-0.14	0.04	1.27	0.83	1.10	1.28
Chemicals	0.93**	-0.02	-3.37**	0.45**	1.12	13.17	4.07	6.54	7.65
Iron & Steel	1.16*	-0.16*	-1.53	0.44	0.91	0.30	1.51	0.55	3.94
Non ferrous	0.99**	-0.10*	-3.57*	-0.53*	0.35	2.97	4.49	0.33	1.29
Mechanical	1.77**	-0.21**	-2.73*	1.37**	0.21	1.11	2.70	1.82	5.86
Vehicles	3.66**	-0.71**	0.84	-0.05	0.01	0.37	0.06	0.47	2.48
Electrical	3.05**	-0.56**	-3.96#	0.36	0.01	3.08	0.48	8.24	4.79
Electronic	2.29**	-0.51**	-3.12#	0.09	0.04	7.10	0.84	1.79	3.39

Column 2 to 5 report estimated coefficient obtained from the model where volatility of real exchange rate is based on an ARCH model and misalignment is computed from the equilibrium exchange rate model. Data on sectorial exports refer to 1997 and drawn from CHELEM data base. (**), (*) and (#) indicate respectively that the coefficient is significant at 1%, 5% and 10%. When there is no star, the coefficient is not significant at 10%.

Table 10. Dynamic profile of exports oriented to Euro Area over subperiods from 1970 to 1995*

Sectors	Algerie			Morocco			Tunisia			Egypt			Turkey		
	70-79	80-89	90-97	70-79	80-89	90-97	70-79	80-89	90-97	70-79	80-89	90-97	70-79	80-89	90-97
Food and agriculture	4.84	0.32	0.39	44.36	29.39	26.84	26.53	11.99	11.78	35.30	7.55	6.98	69.19	32.61	19.43
Wood and Paper	0.13	0.09	0.13	1.87	2.32	1.42	1.49	0.92	1.09	0.40	0.21	0.31	0.22	0.84	1.25
Chemicals	0.66	0.79	0.91	36.00	32.20	13.69	15.12	12.82	6.97	1.05	0.59	2.50	5.42	7.87	8.74
Electronic	0.03	0.04	0.04	0.23	1.56	3.95	0.24	0.97	1.60	0.24	0.39	0.49	0.07	0.46	2.44
Electrical	0.01	0.01	0.02	0.12	0.68	2.02	0.45	2.76	5.90	0.05	0.09	0.16	0.05	0.67	3.09
Energy	91.88	97.52	97.10	0.51	1.99	1.49	35.80	31.69	10.52	54.20	79.83	62.62	2.50	8.45	2.11
Mechanical	0.21	0.31	0.29	0.60	0.97	0.85	0.40	1.12	2.33	0.85	1.14	6.16	0.65	3.59	3.89
Non ferrous	0.33	0.16	0.36	6.34	5.47	3.00	2.38	0.78	0.50	1.17	4.03	4.75	2.69	1.32	1.45
Iron and Steel	1.40	0.70	0.61	1.02	0.44	0.28	2.02	0.14	0.33	0.32	0.46	1.86	0.40	1.27	2.33
Textiles	0.50	0.03	0.13	8.86	24.48	45.95	15.48	36.45	58.31	6.41	5.68	14.11	18.78	42.38	53.85
Vehicles	0.03	0.04	0.03	0.09	0.49	0.52	0.08	0.36	0.67	0.02	0.02	0.06	0.03	0.54	1.41
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

***Authors computations, original data source: Chelem Database (CEPII).**

Table 11. Sectoral export (as a share of GDP) losses in % due to misalignment and excess volatility of MENA currencies with respect their European partners during the period (1990-97)

	Losses due to Misalignment						Losses due to excess volatility					
Sectors	**Mis**	**Algeria**	**Egypt**	**Morocco**	**Tunisia**	**Turkey**	**log Vol**	**Algeria**	**Egypt**	**Morocco**	**Tunisia**	**Turkey**
Energy	-5.13	-34.73	-15.39	0.82	-17.08	-8.62	-0.19	-0.68	-0.99	-0.17	-0.16	-0.99
Food & agriculture	-2.36	-15.98	-7.08	0.38	-7.86	-3.96	0.01	0.04	0.05	0.01	0.01	0.05
Textiles	-5.19	-35.14	-15.57	0.83	-17.28	-8.72	-0.22	-0.78	-1.15	-0.20	-0.18	-1.15
Wood & paper	-2.46	-16.65	-7.38	0.39	-8.19	-4.13	-0.22	-0.78	-1.15	-0.20	-0.18	-1.15
Chemicals	-3.37	-22.81	-10.11	0.54	-11.22	-5.66	-0.02	-0.07	-0.10	-0.02	-0.02	-0.10
Iron & steel	-1.53	-10.36	-4.59	0.24	-5.09	-2.57	-0.16	-0.57	-0.84	-0.15	-0.13	-0.84
Non ferrous	-3.57	-24.17	-10.71	0.57	-11.89	-6.00	-0.10	-0.36	-0.52	-0.09	-0.08	-0.52
Mechanical	-2.73	-18.48	-8.19	0.44	-9.09	-4.59	-0.21	-0.75	-1.10	-0.19	-0.17	-1.10
Vehicles	0.84	5.72	2.53	-0.14	2.81	1.42	-0.71	-2.53	-3.71	-0.65	-0.59	-3.71
Electrical	-3.96	-26.81	-11.88	0.63	-13.19	-6.65	-0.56	-1.99	-2.92	-0.52	-0.47	-2.92
Electronic	-3.12	-21.12	-9.36	0.50	-10.39	-5.24	-0.51	-1.81	-2.66	-0.47	-0.42	-2.66

Column 2 and 8 report estimated coefficient of misalignment and volatility obtained from the model where volatility of real exchange rate is based on an ARCH model and misalignment computed from the equilibrium exchange rate model. The sectoral export losses are computed on the basis of observed misalignment and volatility over the period 1990-1997.